UltraDoser Injector System with AB1500 Controller

USER MANUAL

CRYOTECH INTERNATIONAL

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GENERAL – SECTION I

Safety

Liquid nitrogen (LN_2) has three primary hazards:

1. Extremely cold temperature {(-320 F), (-196C)}
2. Oxygen depletion
3. Potential of bursting sealed environments

1. When working around LN_2, use personal protective equipment such as cryogenic rated gloves, a face shield, and a chemical apron. Any LN_2 that comes in contact with skin may cause burns. Non-insulated LN_2 pipe or fittings, such as a tank connection, will become extremely cold and can cause flesh to freeze upon contact.

2. A release of LN_2 into an enclosed environment will begin to displace the breathable air. When using LN_2 in an enclosed environment, such as a small room where portable LN_2 tanks are filled, Cryotech recommends that an oxygen monitor be installed and proper room ventilation be provided.

3. Due to LN_2's high expansion rate (700 parts GN_2 to 1 part LN_2), the possibility of a pressure burst exists. If LN_2 is trapped in a pipe between two closed valves or in a sealed vessel, then the LN_2 inside will expand and build up pressure. This expansion may result in a rupture of the pipe or vessel. To prevent this, a pressure relief valve must be installed wherever there is a potential to trap liquid.

Principles of LN_2 Dosing

To ensure consistent dosing results, an accurate dose must be delivered to each container AND each container must be processed in the same manner.

Injection systems from Cryotech International guarantee that a precise, accurate dose of LN_2 is delivered. The injection series meets the following fundamental dosing conditions.

Pure Liquid at the Dosing Head

Pure liquid (i.e. liquid with no gas pockets) must be instantaneously available at the dosing head. Cryotech has a unique internal design that ensures the continual availability of pure liquid at the dosing head.

Constant Pressure

Constant pressure at the dosing head is critical requirement for reproducible dose size. The unit has a float valve that is monitored by the controller. During operation, the pressure at the dosing head remains constant.

Dose Duration

The dose duration is tightly controlled by the unit's electronics. Dose duration is measured in milliseconds.

The following production conditions must be controlled to ensure consistent dosing results:

1. Fill levels must be consistent.
2. Fill temperatures must be consistent.
3. Capping techniques must be consistent.
4. Product may not be spilled or splashed out of containers following dose

Unpacking the Injector
The injector will arrive in a specially designed shipping crate. If it is planned to have a mobile injector system or if the unit is being leased the shipping crate should be stored for future use.

It is important that the crate be inspected before unpacking the injector. All exterior parts of the crate should be free from dents and/or other damage. If shipping damage is noted it should be reported to the carrier immediately.

While unpacking the crate, all contents should be inspected. All pieces should be free from dents and/or other damage. If there is a discrepancy between the packing list and the contents in the shipping crate, contact Cryotech immediately at (408) 371-3303.

Injector Unpacking Checklist:

1. Injector reservoir/arm unit with bracket
2. Controller
3. Speed sensor and speed sensor extension cable
4. Container sensor
5. 12’ Extension for distribution cable
6. Two (2) 12’ Polyurethane tubes – labeled as tube 03 and tube 04
7. Two spare compression fittings
8. 10’ Cryotech*Flex* hose (for portable systems)
9. Three dosing nozzles – one installed, two additional and one nozzle installation tool
10. Stainless steel support stand and other accessories (if ordered)

Warranty: Cryotech International

Cryotech International warrants that each of its products will be free from defects in material and workmanship, in the normal service for which the product was manufactured, for a period of one year from the date of shipment to the original purchaser. The following products carry an additional two years of warranty: Stati*Flex* and Dyna*Flex* vacuum insulated piping. To make a claim under this warranty, the purchaser must: 1) give Cryotech written notice within ten (10) days after the discovery of a claimed defect, 2) immediately discontinue the use of the product, and 3) return such product freight prepaid to the location specified by Cryotech for evaluation to validate the warranty claim. If the claimed defect is confirmed by Cryotech's inspection, Cryotech will, at its option and as the purchaser's sole remedy, repair or replace such product or any component part thereof or refund the original purchase price. This warranty is voided by alterations or by repairs of others. Cryotech shall not be liable under this warranty, or otherwise, for defects or accidents caused by the purchaser's negligence, abuse/misuse or modifications to the product or for failures due to corrosion, fire, heat or the effects of normal wear. Proper installation by the purchaser of normal maintenance parts supplied by Cryotech shall not constitute modifications to the product. Any related components or other equipment manufactured by others which may be sold with Cryotech products are not covered by this warranty but would carry any applicable original equipment manufacturer's warranty.
This warranty is in lieu of any other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular purpose. The remedies set forth herein are exclusive. Cryotech shall not be liable for any consequential, special or incidental damages resulting from the delivery, use or failure of the product or from any other cause whatsoever. By accepting delivery of the product sold hereunder, the purchaser acknowledges that this limitation of remedies is reasonable and enforceable. In no event shall Cryotech's liability exceed the value of the product sold.

SPECIFICATIONS – SECTION II

Product Specifications

Dimensions	Reservoir height: 29” (737 mm) Hexagonal: 6” (152 mm) Arm reach : 12” (305 mm)
Dosing Head:	2.0” (51 mm) wide x 9” (229 mm) high
Total Weight w/electronics:	UltraDoser Injector - 32 pounds (14.5 kg) Controller - 22.5 pounds (10.2 kg)
Dosing Range:	Minimum: 0.5 grams/second Maximum: 12 grams/second
Dosing Accuracy:	+/- 5% of dose value
Timing Range:	Effective Minimum: 15 milliseconds Maximum: 1000 milliseconds
Control Voltage	24 VDC
Materials:	Stainless steel construction. Built to food and beverage industry standards.
Crate Dimensions:	90”L x 32”W x 22” H (2286 mm x 813mm x 559 mm) 225 lbs with stand (102 kg) 140 lbs without stand (64 kg)

Utility Requirements

Electrical Supply:	100-240 VAC Input, 150VA MAX., 50-60HZ
Liquid Nitrogen Source:	Maximum 22 psig for portable system, 100 psig for plant system with phase separator. Maximum flow rate 15 gallons per hour
Gaseous Nitrogen or CDA	60 to 100 psi (4.1 to 6.9 bar) 10 SCFH gas per 100 containers per minute

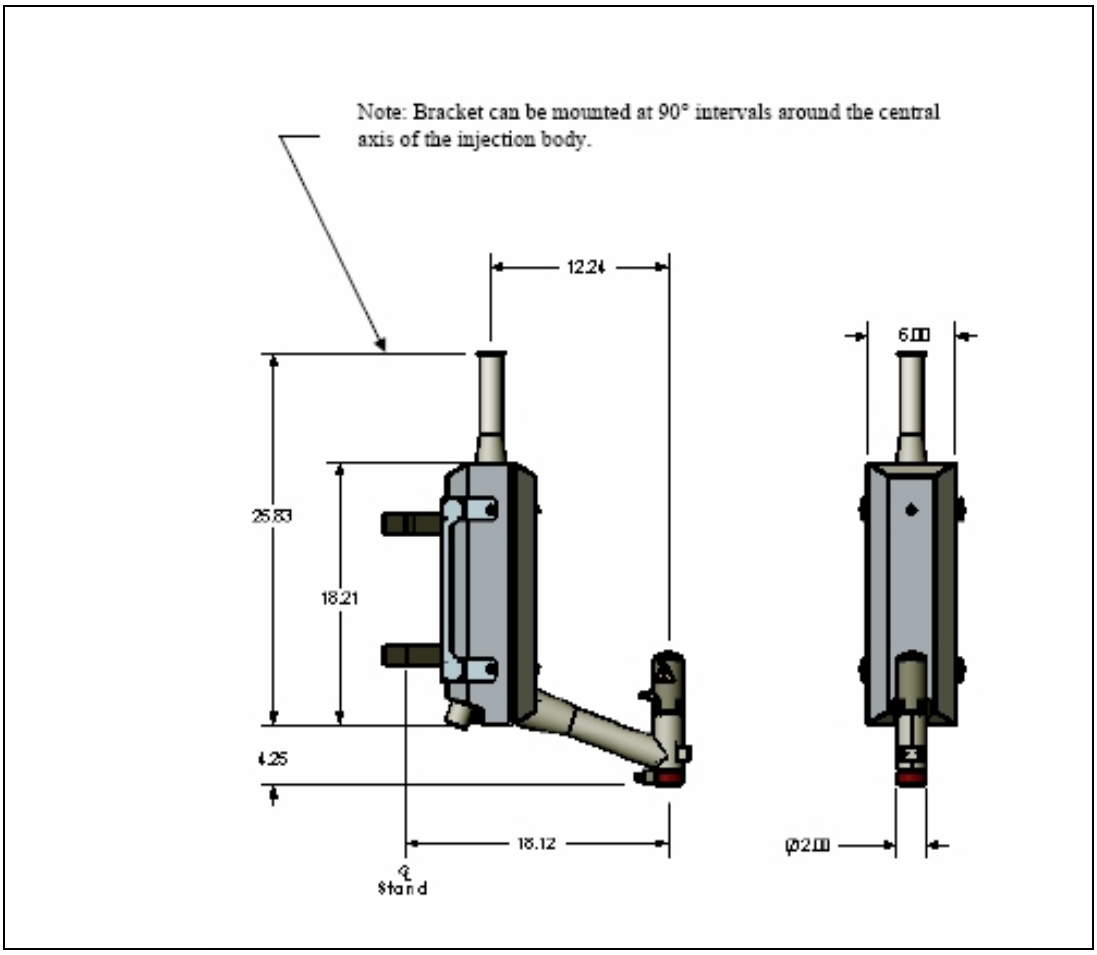


Fig. 1: UltraDoser injector body

SYSTEM COMPONENTS – SECTION III

LN_2 Reservoir

The stainless steel vacuum insulated reservoir provides a ready supply of LN_2 for dosing operations.

Distribution Block

This electrical connection “block” houses the connectors and wiring interface between the operating parts of the Injector unit and the controller. There are five Eurofast connections on this distribution block labeled D1 – D5 as described below. The distribution block connects to the control box via a 36” cable assembly.

Vent Heater Cable Connection, D-1

Labeled D-1 on the distribution block this connector provides +24VDC power to the vent heater. A green light on the cable connector indicates that power is being made available to the vent heater.

Dosing Head Heater Cable Connection, D-2

Labeled D-2 on the distribution block this connector provides +24VDC power to the dosing head heater. A green light on the cable connector indicates that power is being made available to the dosing head heater.

Timing/Container Sensor Cable Connection, D-3

Labeled D-3 on the distribution block this connector provides +24VDC power to the timing/container sensor and indicates sensor activity. A green light on the cable connector indicates that power is being supplied to the sensor. A yellow light will appear whenever a container and/or a container pulse is detected.

Solenoid Valve Cable Connection, D-4

Labeled D-4 on the distribution block this connector provides +24VDC power to the solenoid valve assembly. A green light on the cable connector indicates that power is being supplied to the solenoid valve. A yellow light will appear whenever the solenoid valve has been activated.

Confirm Sensor Cable Connection, D-5

Labeled D-5 on the distribution block this connector provides +24VDC power to the confirm sensor assembly. A green light on the cable connector indicates that power is being supplied to the confirm sensor. A yellow light will appear whenever the pneumatic cylinder has lifted the valve stem. A similar yellow indicator will also be illuminated on the sensor body. This light mirrors the yellow light activity on the cable and confirms the lifting of the valve stem.

Bayonet Connection

This bayonet connection allows the Cryotech*Flex* hose to connect to the injector unit. Bayonets are vacuum insulated and provide a warm, frost-free connection.

Dosing Head

The dosing head is the injector component that delivers the dose of LN_2.

Dosing Valve Assembly

The dosing valve assembly consists of a solenoid, an air cylinder and a stem. This assembly allows a dose of liquid nitrogen be made available in specific quantities as dictated by the operator.

Valve Confirm Assembly

The valve confirm assembly is attached to the pneumatic cylinder. The assembly consists of an electromagnetic sensor and related cabling. The sensor confirms that the valve stem was lifted thereby providing a dose of LN_2.

Dosing Head Heater

The injector unit has a self-regulating dosing head heater. The maximum temperature of the dosing head heater is 150ºF. The purpose of the dosing head heater is to prevent any frost or ice formation at the dosing head area.

The dosing head heater has a built-in splashguard to minimize the dosing nozzle's exposure to splashed product.

The dosing head heater is filled with gaseous nitrogen from the built-in gaseous nitrogen purge. Hence, gaseous nitrogen is always flowing out of the dosing head heater. This positive pressure greatly minimizes the chance of moisture in the ambient atmosphere from contaminating the dosing head.

The dosing head heater assembly is held in place by a set of O-rings. If needed, the heater assembly can be removed by twisting the heater off of the dosing head.

Dosing Nozzle(s)

The injector system utilizes nozzles to deliver specific quantities of LN_2.The size of the dosing nozzle directly impacts the amount of LN_2 dosed. Each unit is supplied with a 0.040" ID (installed), and spares of 0.050" ID, and a 0.060" ID nozzle. Additional sizes (custom) may be ordered from Cryotech. The maximum dosing orifice is 0.125" ID.

GN_2 Purge Pathway

Internal to the injector unit, is a gaseous nitrogen purge pathway. This pathway allows a small amount of liquid nitrogen to exit the reservoir area. Once in the purge pathway, the liquid warms and turns into a gas. This gas is used for the dosing head purge.

Drain Plug

A drain plug is located on the GN_2 purge pathway. When removed, this drain allows the LN_2 to drain from the Injector reservoir.

SRV

The safety relief valve (SRV) is set to 50 psi. It protects the hose against over pressurization. If the pressure inside the unit is 50 psi or greater, the safety relief valve will vent excess pressure. Under normal operating conditions, the SRV should not vent.

Vent Heater

Each injector unit has a self-regulating 26 watt (maximum) dosing vent heater. The maximum temperature of the dosing head heater is 150ºF. The purpose of the dosing head heater is to prevent any frost or ice formation at the vent area. It is critical that no frost or ice be allowed to build up at the vent area. If ice develops it has the potential of entering the injector reservoir and causing a malfunction.

Cryotech*Flex* Hose

A vacuum insulated hose that provides a connection between the injector unit and the LN_2 supply.

Inlet Filter

A 10-micron stainless steel inlet filter is provided with each unit. The filter is located inside the male bayonet on the Cryotech*Flex* hose connection point.

Mounting Bracket Assembly

Each UltraDoser is supplied with a mounting bracket assembly. The assembly consists of the bracket attaching to the UltraDoser and two clamps. These clamps are designed to fit o n 1-1/2” stainless steel rod. The bracket can be mounted in 3 positions: Longest reach position, the clamps are opposite the arm straight back and both sides perpendicular to the arm.

Dosing Head Pressure Gauge

This gauge measures the pressure of the liquid nitrogen source. Note that the source pressure should be between 10 – 22 psi (i.e. dewar fed). If the source pressure drops below 10 psi, the source has most likely been depleted and should be replaced.

If the source pressure is greater than 22 psi, IMMEDIATELY STOP THE FILLING OPERATION by shutting off the source valve (i.e. the valve on the dewar). The pressure of the source must be 22psi before the fill operation can occur. Filling at a pressure higher than 22psi can damage the equipment and/or cause liquid nitrogen to spill from the injector vent.

Controller

The injector controller is a state-of-the-art device incorporating a programmable logic controller (PLC) providing precise timing and distribution of control signals to the Cryotech injector.

SYSTEM INSTALLATION – SECTION IV

Application Evaluation

The Cryotech injection system is used for both inerting and pressurization applications. The application must be evaluated to determine the ideal location of the dosing head on the filling line.

Inerting – Inerting is the process of displacing oxygen/air within a container to increase product shelf life. To inert a container, a relatively large dose of LN_2 is introduced into the container. The dose evaporates displacing air and oxygen from the container. The container is then sealed so that minimal oxygen/ air is allowed to re-enter the container. The ideal location must allow for enough time between dosing and capping/sealing so that the liquid dose may have time to be converted into a gas.

Pressurization – Pressurization is the process of introducing liquid nitrogen into a container, sealing the container and allowing the liquid nitrogen to warm and change into its gas form while the container is capped. Sealing the container while the liquid expands causes an increase in pressure within the container. To pressurize a container, a relatively small dose of LN_2 is introduced into the container immediately before the container is capped or sealed.

Space Availability

Once the ideal dosing location has been determined, the operator must confirm that there is sufficient space to install the dosing head. A 2” x 9” area is needed for the dosing head.

Support Stand Location

1. The injector can be installed on either side of a production line. Select the side that best suits the workplace. The injector can be mounted in the mounting bracket such that the 1½” round stand bracket is located on either side perpendicular to the arm or straight back opposite to the arm.

2. A distance of 18.2” is measured directly back from the dosing location. This is the installation location of the stand. If the injector arm is more or less perpendicular to the container travel the fine distance adjustment can be made by turning the Injection left or right on the stand.

3. The location of the stand is then marked and four (4) 5/8” bolts are installed in the proper locations.

Mounting the Injector Unit

Once the stand is installed, the injector unit can then be mounted on the stand using the factory supplied equipment clamps.

Installing the Injector Controller

The controller should be mounted at a convenient location. Optional brackets to mount the controller on the 1½” stand post are available from Cryotech International.

Controller Cable Connection Port (J-2)
The controller I/O (input/output) cable, a component of the distribution block, is connected to the controller at port J-2. For remote locations of the Controller, extension cables of 12 and 25 feet are available. Refer to spare parts list.

Speed Sensor Connector (J-5)
If the controller has an option for speed compensation it will require a sensor when operating in “Speed Compensated” mode. The sensor provides the controller with pulses that are used to calculate the line speed. This sensor is only required when the unit is in “Speed Compensated” mode. Sensors must be PNP for Siemens. The injector uses a 30 mm inductive proximity sensor to detect the speed of the line. The speed sensor should be connected to the controller at J-5.

Aux. connector (J-7)
Customers have the option of purchasing a Container Detect Sensor. When used with a 3-sensor system, distribution block output D-3 is used solely for the timing sensor. The container detect function is now transferred to this input and is strictly for the container detect. This input is also NPN/PNP specific. The correct sensor must be used.

Pressure Tap Outlets
There are two pressure taps on the UltraDoser. One pressure tap allows the controller to monitor the supply pressure. The other pressure tap allows the controller to monitor the dosing head pressure.

Blanked off Ports
The controller has a two blanked off ports for future expansion.

Figure 2: Controller Connections

Utility Connections

Electric

An electrical power cord, 6 feet long, is supplied with each unit. The power cord is to the connected to the bottom of the Injector controller at connection point J-1. The injector will operate with a voltage potential between 100-240VAC, 50/60Hz.

Liquid Nitrogen

The Cryotech*Flex* hose is to be connected to the inlet of the injector. The Cryotech*Flex* hose male bayonet is provided with a 1/4" FPT on the tip. A 10 micron filter is to be inserted into this FPT fitting.

The 1/2" JIC end of the Cryotech*Flex* hose is then to be connected to the 1/2" male flare fitting on the low pressure (22psi) LN_2 dewar.

Gaseous Nitrogen

A source of gaseous nitrogen must then be connected to the injector. The pressure must be a minimum of 60 PSI and the volume is approximately 10 SCFH per 100 containers per minute.

Installing the Timing Sensor

When input D-3 is used as a combination timing/container sensor the sensor must be positioned to perform both functions. The optimal distance from the dosing head center to container detection is approximately 3/4 the distance between containers. For example: If the centerline distance between two containers is 4.7 in. (120mm), then the timing sensor is approximately 3.5 in. from the center of the dosing head. The sensor used must be a PNP type sensor for the Siemens based system. The injector is commonly supplied with a 12mm ultrasonic sensor.

When D-3 is used solely as a timing sensor it is positioned away from the containers-on a remote gear typically that provides 1to1 pulses per container. The gear is moved until the sensor detects the gear. At this point the measurement of container to dosing head must be made as accurately as possible.

ACCESSORIES – SECTION V

Mounting Bracket Assembly

Each injector unit is supplied with a mounting bracket assembly. The assembly consists of the bracket attaching to the injector with two clamps. These clamps are designed to fit on 1-1/2" stainless steel rod. The bracket can be mounted in 3 positions: Longest reach position, the clamps are opposite the arm straight back and both sides perpendicular to the arm.

Positioning the Dosing Head

The dosing head must be directly over the container opening. The dosing head is installed so that is approximately 1/2" - 3/4" above the container opening. It may however be installed up to 3" above the container opening. If there is a possibility of the product splashing out of the containers, it is suggested to mount the dosing head at the maximum distance.

Cryotech*Flex* Hose

A vacuum insulated hose that provides a connection between the Injector unit and the LN_2 supply.

Inlet Filter

A 10-micron stainless steel inlet filter is provided with each unit. The filter is located inside the male bayonet on the Cryotech*Flex* hose connection joint.

Encoder Information

An encoder may be used with the injection system in lieu of a speed sensor. An encoder provides additional pulses per container. The additional pulses allow for greater speed resolution allowing the injection unit to dose more effectively-specifically at higher line speeds. The encoder is typically located on a known gear or star wheel matching the speed of the production line.

The following connection information is for an AMCI encoder p/n DC25F-S1FPRGMCS. The mating connector is p/n MS-16. Note: Only one channel is used to provide necessary pulses for the injector system. For correct encoder functionality, shielded cabling must be used. Type CM Communications Cable is a suitable option. The encoder case should be grounded, either thru its mounting bracket or separate ground wire.

Encoder Cable Connections:

Encoder Pin No.	Function	Wire color*	Controller Pin No.
A	CH- A Output	Green or Blue	4
D	+ DC Output	Red	1
F	DC Return	Black	3
G	Case Ground	Shield Wire	N/C

* Wire color refers to the conductors of the shielded communication cable.

Programming the encoder

The DC25F-S1FPRGMCS is a programmable device allowing the user to set the number of pulses per encoder revolution. For more specific information/instructions log on to the AMCI website at:

http://www.amci.com/documents.asp.

VALVE HEAD ASSEMBLY – SECTION VI

Electro-pneumatic Actuated Valve

The Injector may be provided with either a standard valve assembly or an Electro-pneumatic actuated dosing valve assembly. The valve is driven by a pneumatic cylinder. Gas pressure to the cylinder is controlled by a 24 volt solenoid valve.

CONTROLLER – SECTION VII

The electrical control box “controller” is used to provide electrical power for the system, take input signals from sensors and provide output signals to the injector to activate the dosing valve. The Cryotech Model 2830 Injection Controller is a Rockwell based system utilizing a ML1500 PLC, Power Supply and HMI (Touch Screen) manufactured by Rockwell Corporation. The controller PLC has been wired to support PNP type sensors.

The Controller incorporates speed compensation enabling customers to vary line speeds and still maintain accurate bottle/can dosing while in discrete dose mode.

Components

Figure 3: Controller front view

Light Tower

The indicator light provides a visual display of the operating status of the controller.

Green – Unit is in normal operation.

Solid Amber – Unit is in disable mode.

Flashing Amber – Unit is in Quick Service mode.

Flashing Red – Unit is indicating a fault condition but still operational. See Alarms for additional information.

Start-Up Procedure

Step 1: Remove the yellow power cable from its shipping packaging and connect to the ac input connector located on the bottom of the controller. Connect the I/O cable from the distribution block of the injector to the I/O connector on the bottom of the controller.
Step 2: Turn unit on

Controller Screens

Upon power-up the controller will go through a self check which will result in the solenoid activating for 5 pulses. The controller will then complete the boot-up sequence and display the ***"Main"*** screen.

Main Screen - *Default screen*

The system will display the **Main** screen as the default screen. From this screen the operator can navigate to other screens and functions.

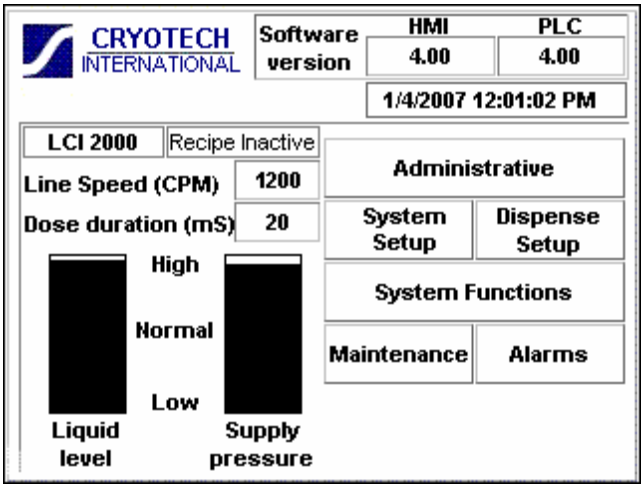


Figure 4: Main Screen

Main Screen Buttons:

- ***"Administrative"*** - Provides access to administrative screen to log on and configure terminal.
- ***"System Setup"*** - Takes user to **SET-UP** screen used to calibrate pressure, and liquid levels. *NOTE*: *This button is only seen if there is an administrator logged into the system.*
- ***"Dispense Setup***" - Takes user to screen used to input parameters for dosing including; nozzle to dosing head distance, container centerline to centerline distance, continuous dose speed and pulses per container. *NOTE*: *This button is only seen if there is an administrator logged into the system.*
- ***"System Functions***" - Screen provides controls to enable/disable dosing, activate self-test, quick service, and auto/manual modes.
- ***"Alarms"*** - Screen shows alarm conditions

- ***"Maintenance"*** - Used on initial calibration to save the system fill pressure and liquid level parameters and retrieve them should the need arise to go back to initial parameters. *NOTE*: *This button is only seen if there is an administrator logged into the system.*

Screen Graphs

- The Main screen is provided with two graphs to provide a status of the system liquid level and supply pressure. The levels are set in the "***System Set-Up"*** screen. Levels that are too low or too high generate an alarm and a flashing red light.

Display items

- Line Speed - Shows the speed of the production line. Dose Duration Display– Amount of time dosing valve is open (milliseconds).
- LCI 2000 / LCI 400 - There are two modes of operation. The LCI 2000 mode is the speed compensated mode. The LCI 400 mode is not speed compensated.
- Recipe Inactive / Recipe Active - Shows if a Recipe is active or inactive. Does not appear when in LCI 400 mode.
- Software Versions PLC and HMI

Administrative Screen

Provides access to special functions.

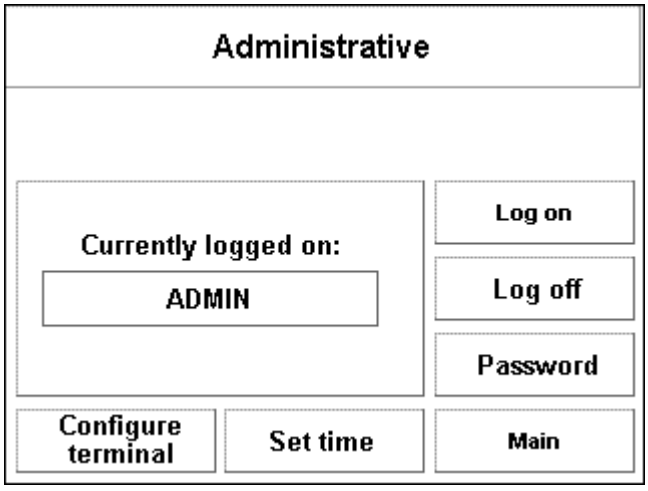


Figure 5: Administrative screen

Administrative Screen Buttons:

- ***"Log On"*** - Brings up log on screen. Enter User Name and Password.
- ***"Log Off"*** - Logs user off. *Only visible after logon.*
- ***"Password"*** - Allows logged on user to change its password. *Only visible after logon.*
- ***"Main"*** - Takes user to the main screen
- ***"Configure Terminal"*** - Allows access to terminal for a variety of functions, such as touch screen calibration and file management.

- ***"Set Time"*** - Communicates with the PLC to set the correct date and time. Date/Time is set at the CRYOTECH factory and should not require modification. However, if necessary to change the date or time, see the instructions below.

  Set Date/Time – The panel gets its' clock from the timer located within the PLC. The PLC must first be told to keep time based upon an input from the panel. Once complete the clock information is fed back to the panel and is maintained correctly within the PLC. To set the correct date and time:

  1. Press the ***"Set Time"*** button. This brings up the date/time screen in Figure 6.

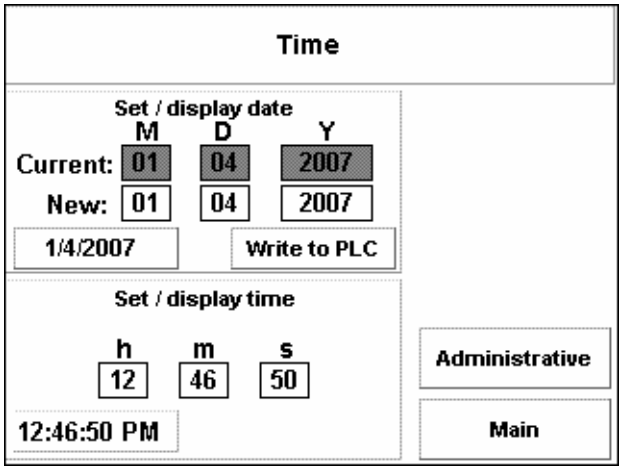


Figure 6: Initial date/time screen

  2. Press any of the time or date fields. This action will bring up a keypad allowing for the insertion of time and date information.

  3. Once the correct date and time have been inserted press ***"Write to PLC"***

  The system will now keep the correct date and time. A delay of up to one minute may be experienced before the newly inserted date and time appear in the corresponding fields. This is normal.

Access and Passwords

The controller has been programmed with a user hierarchy. When accessing certain screens, buttons, or fields, a user will be required to log on and provide a password. Figure 7 illustrates the log-on screen. Pressing the field area ***"User"*** provides the user with a alpha/numeric keypad, Figure 8, to enter the log-on information. After each has been entered the ***"Enter"*** [↵] button must be pressed to acknowledge the user and/or password.

Figure 7: Login Screen

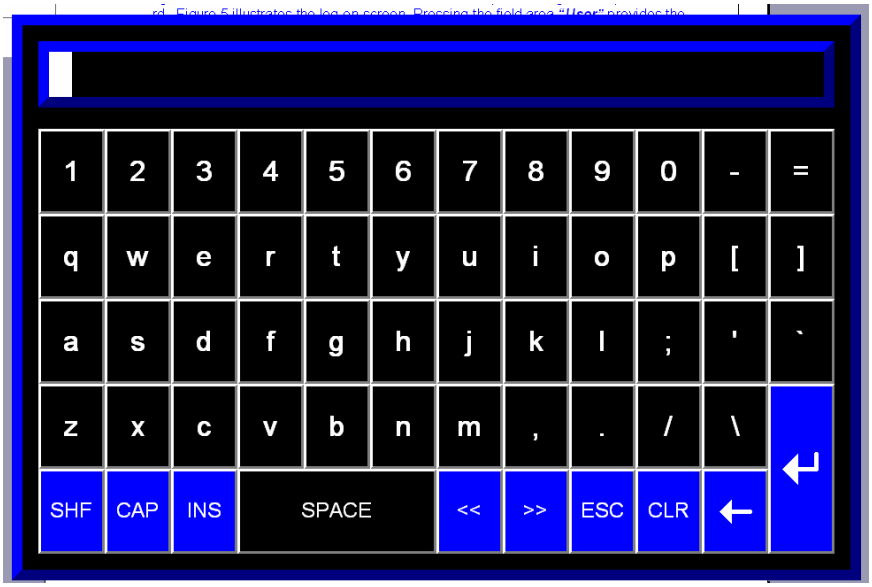


Figure 8: Alpha/Numeric Keypad

When first initiating the system it important to change administrative password. The default user/password is:

Administrative access - All functionality and screens:
User ADMIN, Password ADMIN

It is important to keep a log of passwords to ensure continued access to the system. If it is lost it cannot be restored without downloading a new program.

IMPORTANT! - CRYOTECH has established an administrative password. This password will be used by CRYOTECH personnel if an inadvertent erasure of other passwords occurs.

System Setup Screen - *Accessible only when logged on.*
Set by Cryotech Personnel before the system leaves the factory. There should be no need to modify these settings.

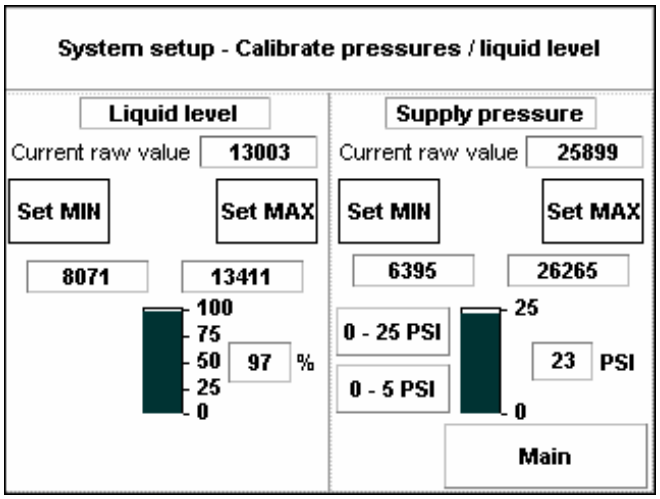


Figure 9: System Set-Up, Calibration screen

The ***"System Setup"*** button on the main screen is the first step prior to incorporating LN2 into the system. System Setup sets the default values for the liquid level and supply pressure of the injection system and allows for calibration of each. The PLC has been programmed to input a "raw" number, a calculated number based upon the initial readings of the liquid level and supply pressure transducers located within the controller.

Dispense Setup Screen - *Accessible only when logged on.*
Provides a means to precisely setup the system for dosing properly.

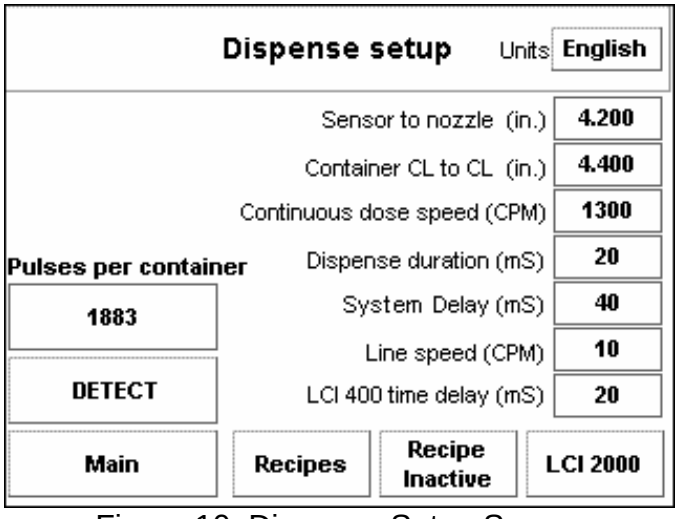


Figure 10: Dispense Setup Screen

Dispense Setup Screen Buttons:

- **"Units"** - The button in the upper right hand corner of the screen displays the unit of measurement that the controller uses to calculate correct dose location in speed compensated mode. If the distance measurements made for the ***"Sensor to Nozzle"*** and ***"Container CL to CL"*** are in inches then this button should read English. If the distances are measured in mm then this button should read Metric.

- ***"Pulses per Container"*** - The controller will not accurately dose bottles if the 'Pulses per Container' value is incorrect. The controller will calculate 'Pulses per Container' by pressing the ***"DETECT"*** button on the Dispense Setup screen.

- ***"Sensor to nozzle"*** - Enter measured value by pressing ***"Sensor to nozzle"*** button. A numeric keypad will pop up, Figure 11. Enter value and press 'Enter" [↵]

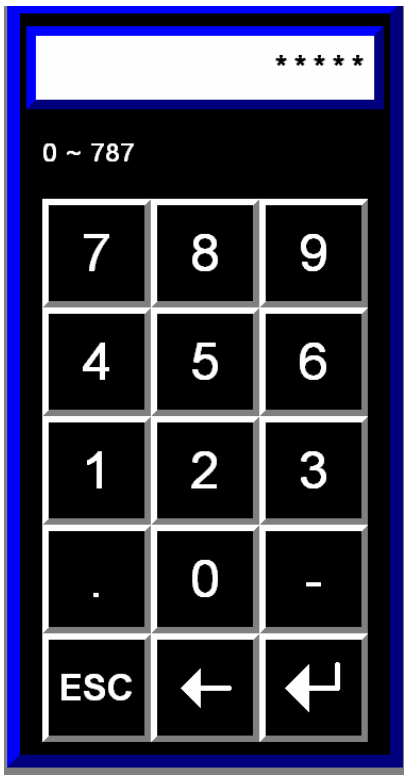


Figure 11: Numeric Keypad

- ***"Container CL to CL"*** - The distance from one container to the next container must be accurately measured. This distance should be measured at the centerline of the containers. Multiple measurements should be made on different bottles to verify this distance. Enter measured value by pressing ***"Container CL to CL"*** button. A numeric keypad will pop up, Figure 11.

- ***"System Delay"*** - This value is set at the factory and does not normally require adjustment. To determines if the correct value is set into the controller, operate the production line at a rate of 100 CPM or less and verify the dose is entering the bottle just inside the leading edge of the opening. The factory value may have to be changed up or down depending on several parameters including the gas pressure

and the distance between the top of the container and the dosing nozzle. If values less than 20ms or greater than 40ms are required to adjust the dose correctly, there may be an error with either the Pulses per Container value or one of the two distance measurements made during setup. Pressing the ***"System Delay"*** button will bring up the numeric keypad, Figure 11.

- ***"Dose Duration"*** - This is the time in milliseconds the dosing valve is open. Normal settings range from 15 to 40 ms on a production line that is running approximately 600 containers per minute. The proper duration for each line and product depends on many different factors and can only be determined on the actual production line. Pressing the ***"Dose Duration"*** button will bring up the numeric keypad, Figure 11.

- **Continuous Dosing Speed** - This is the speed in CPM the injection system changes from discrete dosing to continuous dosing. Continuous dosing is a mode where the dosing valve is always open unless there are no containers present. Pressing the ***"Continuous Dosing Speed"*** button will bring up the numeric keypad, Figure 11.

- **Recipe Buttons** - The two buttons at the bottom of the Dispense Setup Screen activate the recipes and allow the user to create the recipes. ***Most applications do not require Recipe***S. The Recipe Inactive wording should be visible for most operating conditions.

- **System Mode** - The controller has two modes of automatic operation, LCI 2000 and LCI 400. The LCI 2000 mode is a speed compensated mode that calculates where the bottle is for all line speeds and adjusts the dose delay accordingly. The LCI 400 mode has a fixed delay where a container is detected and controller always waits a "fixed" number of milliseconds before it doses. This mode should only be used for very slow lines, 100 CPM or less, or when the encoder/speed sensor fails. Normal operation will be in the LCI 2000 mode.

System Functions Screen

The **System Functions** screen serves as the location for activation of the system once all the parameters have been set. Buttons are shown in figure 12 and describes as follows:

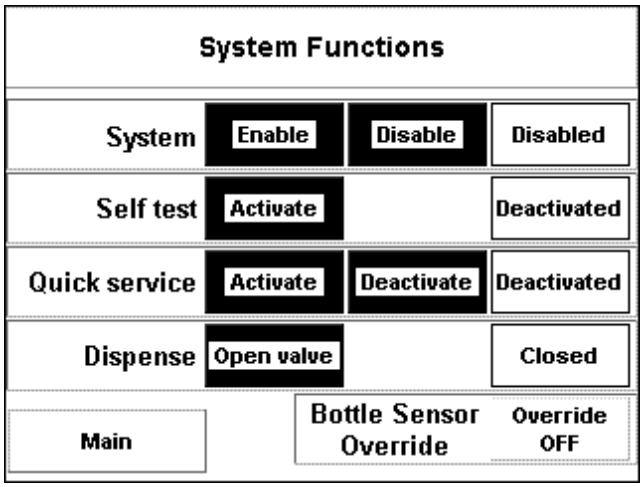


Figure 12: System Functions Screen

System Function Buttons:

- ***"System"*** – The enable button allows the system to operate when containers are detected. The ***"Disable"*** button prevents the system from dosing. Upon powering the system up, the unit automatically defaults into **Disabled** mode. The user must press the ***"Enable"*** button and the unit must indicate a change from **Disabled** to **Enabled**. Actual dosing starts once line has been started.
- ***"Self Test"*** – Used to test the firing of the dosing solenoid. Pressing self test activates the solenoid for 5 pulses. Self Test can only be activated when the unit is in Disabled mode.

- ***"Quick Service"*** – The quick service button engages a solenoid which routes gaseous nitrogen (GN2) through the body to the dosing head. This is typically used for purging the system to ensure a clean pathway for liquid to flow. If a system has been left off for some time or exposed to air, moisture may have accumulated which could result in ice formation causing a blockage in the system. Purging by sending gaseous nitrogen will "dry out" the system.

- ***"Dispense"*** – The dispense function allows the user to manually open and hold open the dosing valve when the unit is in the disabled mode. The valve is opened by pressing and holding the Open Valve button. The button may be held indefinitely holding open the dosing head valve or pulsed by pressing and releasing the button.

- ***"Bottle Sensor Override"*** - The bottle sensor Override button allows the system to run even when there is no bottle sensor present. The Override must be activated if either the bottle sensor is malfunctioning or the timing sensor is being used for both timing and container present. Pushing button will toggle Override. When operating in a three sensor mode (speed/encoder, timing, container present), the override button should indicate **Override OFF**. If the system is configured in the two sensor mode (speed/encoder, container), the override button should indicate **Override ON**.

Maintenance and Factory Setup Screen

Used on initial calibration to save the system fill pressure and liquid level parameters and retrieve them should the need arise to go back to initial parameters.

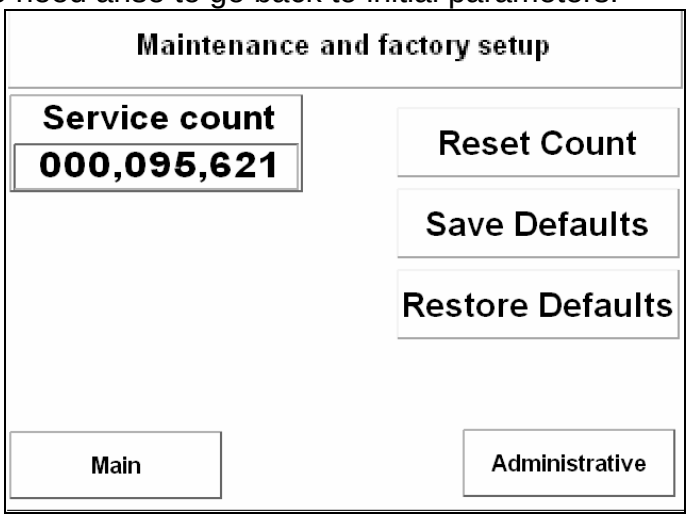


Figure 13: Maintenance screen

IMPORTANT! – This screen is used on initialization by CRYOTECH Personnel. Modification of values using this screen could disrupt dosing. Do not use unless properly trained by CRYOTECH Personnel.

The Restore Defaults button loads the values set by the factory into the minimum and maximum values for the liquid level and supply pressure. The current values will be replaced.

Alarm Screen

Indicates alarm conditions that should be examined but may not necessarily require immediate attention.

Figure14: Alarm Screen

Note: Alarm conditions do not stop nitrogen dosing. An alarm is denoted in the light tower by a flashing red light and is also indicated in the alarm screen, figure 14.

Example:

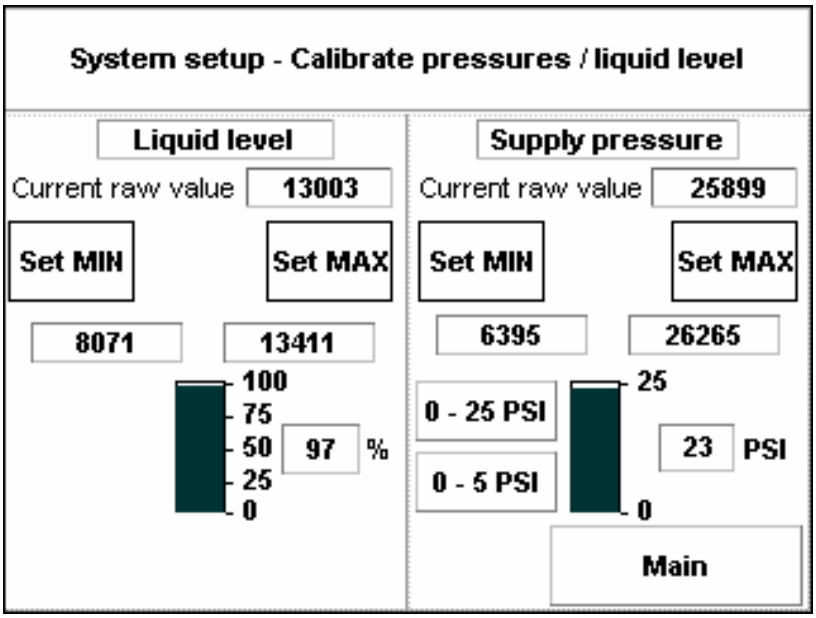
A flashing red light is noted. When calling up the alarm screen the fault is indicated as a liquid level low. The system continues to run and dosing well but the light continues to flash red. After a couple of minutes the light changes back to green indicating all is well and the liquid level low fault disappears from the alarms screen. The system was just alerting the user of a low level before the feed system began providing more LN2. The following faults will trigger an alarm condition:

- Speed sensor fault
- Dose valve fault
- Dose valve stuck open
- Supply Pressure high
- Supply Pressure low
- Liquid level high
- Liquid level empty
- Dose Disable depressed

Controller Set Up & Operation

The following is set by Cryotech Personnel before the system leaves the factory. There should be no need to modify these settings. This information is included for reference or if the system has been taken down for maintenance and has been non-operational for an extended period of time.

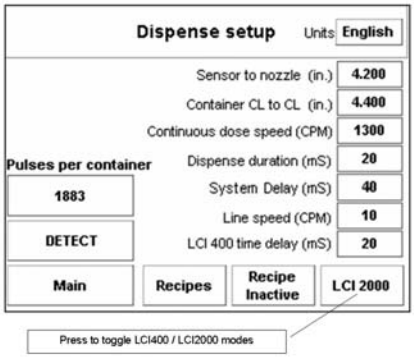
The ***"System Setup"*** button on the main screen is the first step prior to incorporating LN2 into the system. System Setup sets the default values for the liquid level and supply pressure of the injection system and allows for calibration of each. The PLC has been programmed to input a "raw" number, a calculated number based upon the initial readings of the liquid level and supply pressure transducers located within the control box (see figure 2). An example of these raw numbers is shown.



With no LN2 in either the LCI or in the supply line, the raw values depict the "zero" supply pressure and liquid level. Press "Save as Min" for both supply pressure and Liquid level. Also note the "0-25 PSI" and "0-5 PSI" buttons. These buttons correspond to the type of LN2 delivery system being used. If operating from a Dewar the scale 0-25 PSI is to be used. Pressing this button will change the bar graph accordingly. The 0-5 PSI will do likewise if the delivery system is a phase separator. The introduction of LN2 into the system will cause the raw values for liquid level and supply pressure to rise. When the system has stabilized indicating full levels the "Save as Max" buttons are pressed setting both the maximum liquid levels and supply pressure and will be shown in the appropriate graphs. The numbers corresponding to PSI and % of liquid level will be shown in the fields adjacent to the graphs. The minimum and maximum values can be set manually by pressing the min or max values and manually entering the new value.

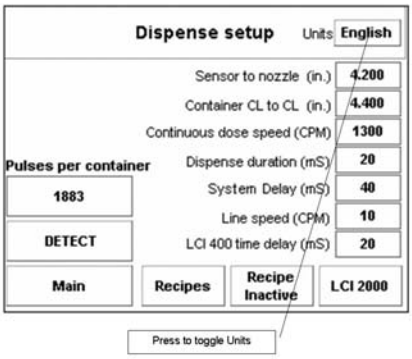
System Mode

The controller has two modes of automatic operation, LCI 2000 and LCI 400. The LCI 2000 mode is a speed compensated mode that calculates where the bottle is for all line speeds and adjusts the dose delay accordingly. The LCI 400 mode has a fixed delay where a container is detected and controller always waits a "fixed" number of milliseconds before it doses. This mode should only be used for very slow lines, 100 CPM or less, or when the encoder/speed sensor fails. Normal operation will be in the LCI 2000 mode.



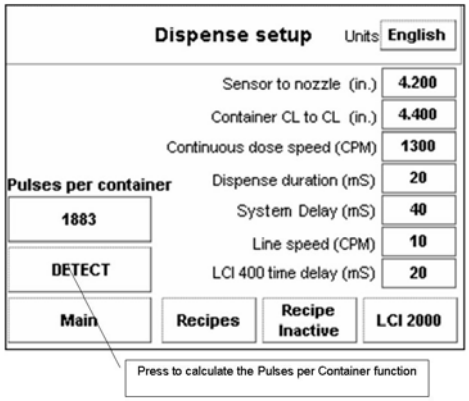
Units

The button in the upper right hand corner of the screen displays the unit of measurement that the controller uses to calculate correct dose location in speed compensated mode. If the distance measurements made for the ***"Sensor to Nozzle"*** and ***"Container CL to CL"*** are in inches then this button should read English. If the distances are measured in mm then this button should read Metric.



Pulses per Container

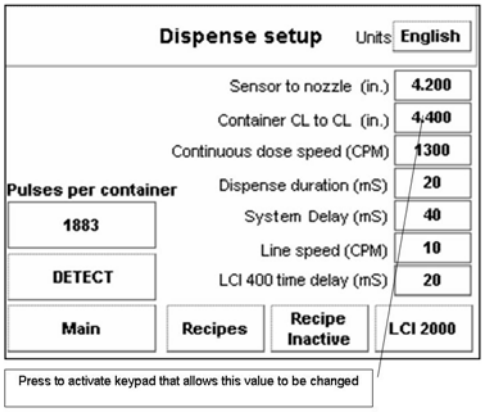
The controller will not accurately dose bottles if the 'Pulses per Container' value is incorrect. The controller will calculate 'Pulses per Container' by pressing the ***"DETECT"*** button on the Dispense Setup screen. Always check to see that the "***Line Speed"*** indicator is reading the actual line speed. This can be done by counting the number of containers that are processed in one minute and comparing the count to the value displayed on the screen. ***It is critical that the Pulses per Container be detected.***



Synchronizing the Dose with the Container

Container to Container Distance

The distance from one container to the next container must be accurately measured. This distance should be measured at the centerline of the containers. Multiple measurements should be made on different bottles to verify this distance.



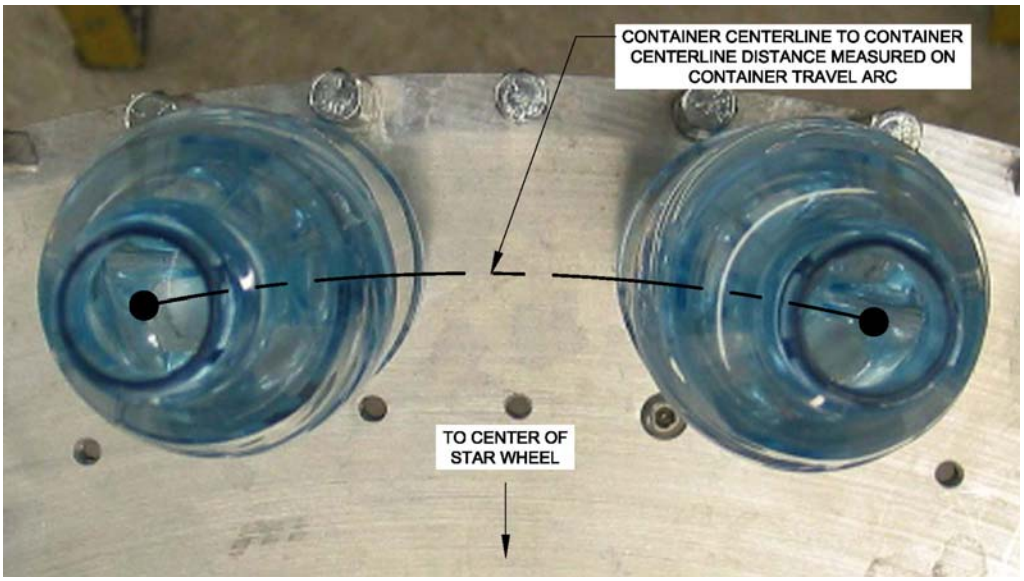


Figure 15, Container Centerline Measurement

Enter measured value by pressing ***"Container CL to CL"*** button. A numeric keypad will pop up, Figure 16. Enter value and press 'Enter" [↵]

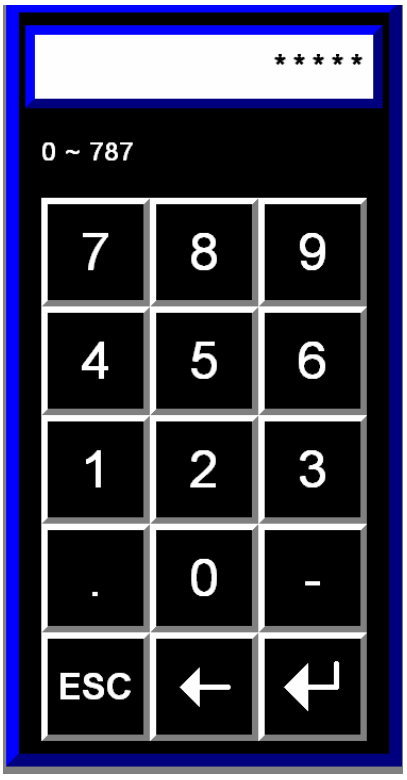
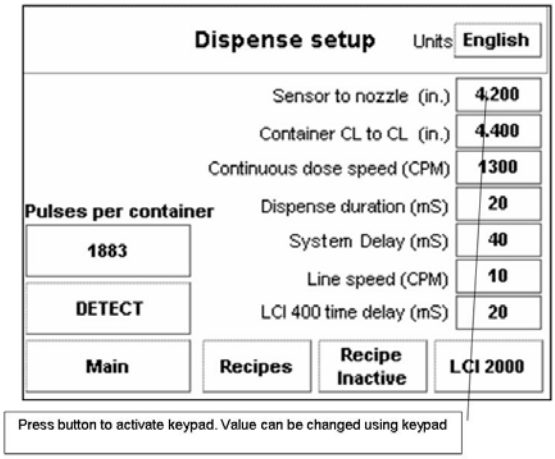


Figure 16: Numeric Keypad

Timing Sensor

The timing sensor synchronizes the dose and the container. It is important that the correct value be entered into the controller. This parameter is determined by determining the distance from the center of the dose to the edge of the container opening when the timing sensor **initially** detects the bottle or capper clock signal.



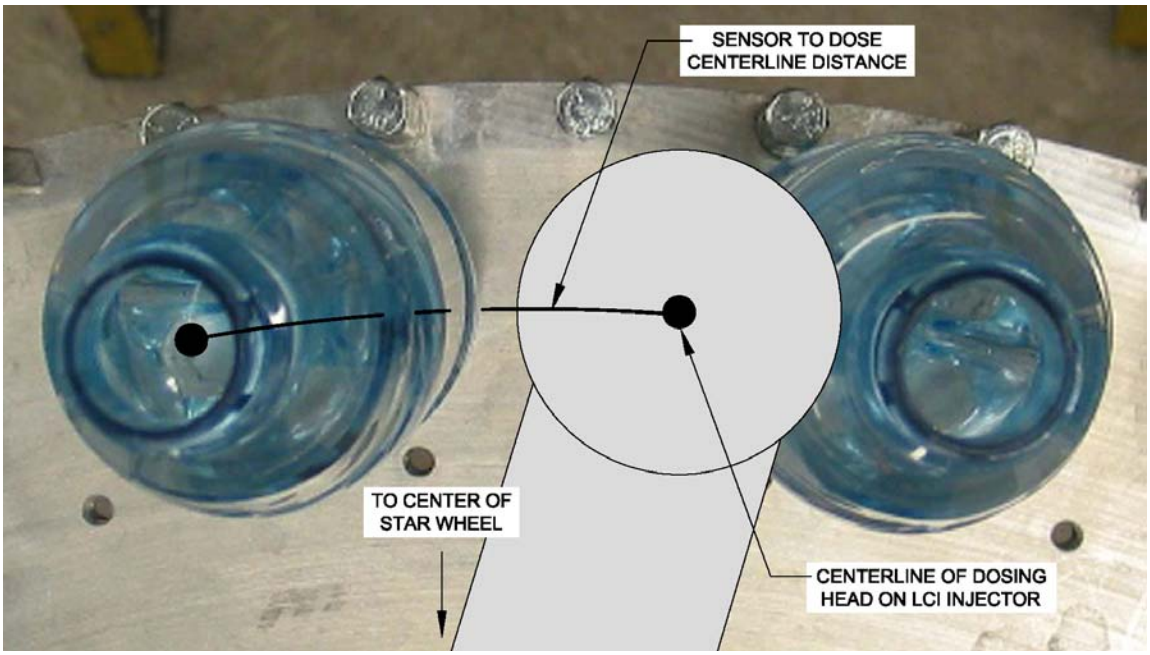
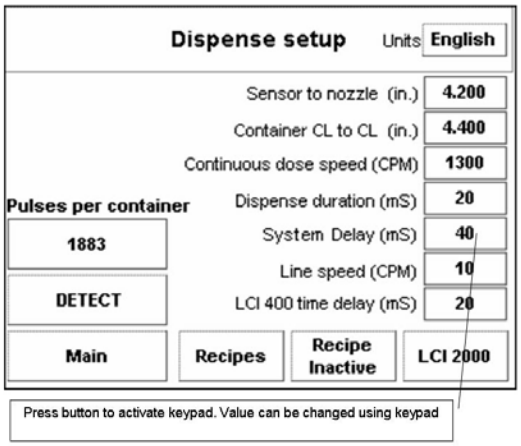


Figure 17: Sensor to Nozzle Measurement

Enter measured value by pressing ***"Sensor to nozzle"*** button. A numeric keypad will pop up, Figure 16.

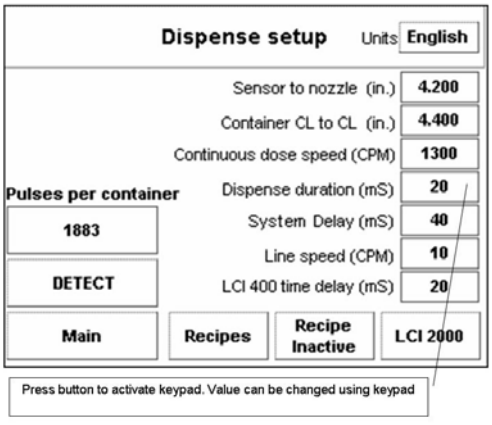
System Delay

This value is set at the factory and does not normally require adjustment. To determines if the correct value is set into the controller, operate the production line at a rate of 100 CPM or less and verify the dose is entering the bottle just inside the leading edge of the opening. The factory value may have to be changed up or down depending on several parameters including the gas pressure and the distance between the top of the container and the dosing nozzle. If values less than 20ms or greater than 40ms are required to adjust the dose correctly, there may be an error with either the Pulses per Container value or one of the two distance measurements made during setup. Pressing the ***"System Delay"*** button will bring up the numeric keypad, Figure 16.



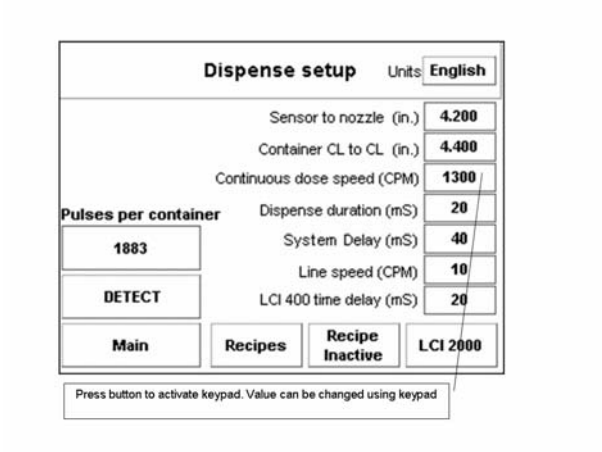
Dose Duration

This is the time in milliseconds the dosing valve is open. Normal settings range from 15 to 40 ms on a production line that is running approximately 600 containers per minute. The proper duration for each line and product depends on many different factors and can only be determined on the actual production line. Pressing the ***"Dose Duration"*** button will bring up the numeric keypad, Figure 16. If the desired results cannot be obtained by changing the dose duration, the injection system nozzle can be changed to allow either more or less flow.



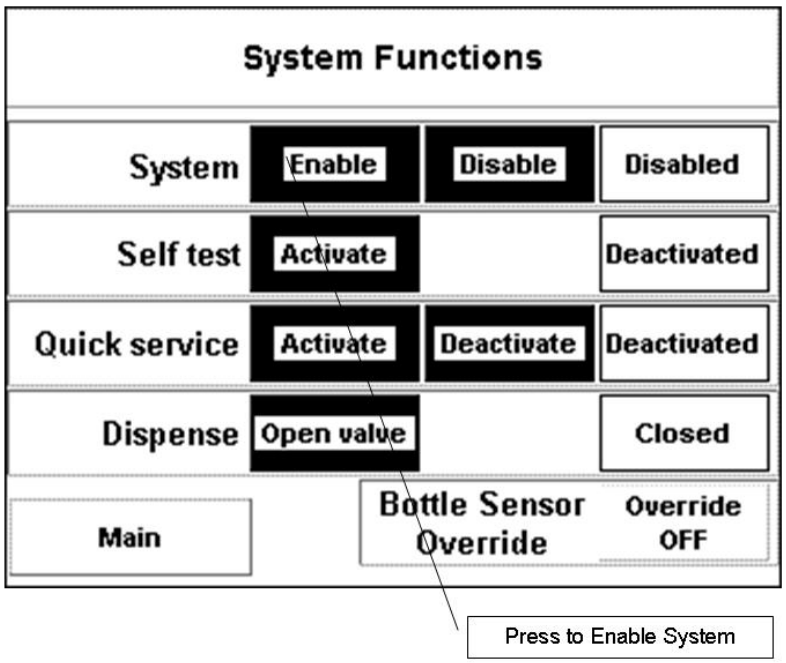
Continuous Dosing Speed

This is the speed in CPM the injection system changes from discrete dosing to continuous dosing. Continuous dosing is a mode where the dosing valve is always open unless there are no containers present. Pressing the ***"System Delay"*** button will bring up the numeric keypad, Figure 16.



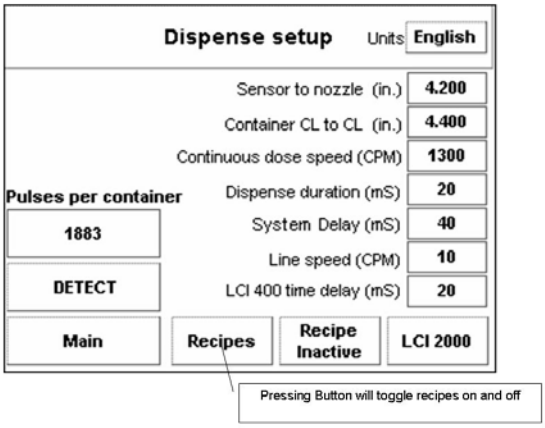
Enabling the System

The System is enable from the System Function Screen. The enable button allows the system to operate when containers are detected. The ***"Disable"*** button prevents the system from dosing. Upon powering the system up, the unit automatically defaults into **Disabled** mode. The user must press the ***"Enable"*** button and the unit must indicate a change from **Disabled** to **Enabled**. Actual dosing starts once line has been started.



Recipes

The two buttons at the bottom of the Dispense Setup Screen activate the recipes and allow the user to create the recipes. ***Most applications do not require Recipe***S. The Recipe Inactive wording should be visible for most operating conditions.



When the injector is in the LCI 2000 mode there are two methods of operation. Normal operation is without recipes. A second method of operation is using recipes. The recipe method allows the storage of unique dose durations for every 100CPM in line speed. This feature can be used if the line runs products that require different amounts of nitrogen. The controller can store multiple recipes for different size containers or product lines.

Figure 18 shows the recipe screen with a dose duration of 40ms. Dose durations for all speed ranges can either be equal or vary with each speed range. Dose durations are set by the user by pressing to the right of the speed range. Recipes are stored in the Stored Recipe Display area.

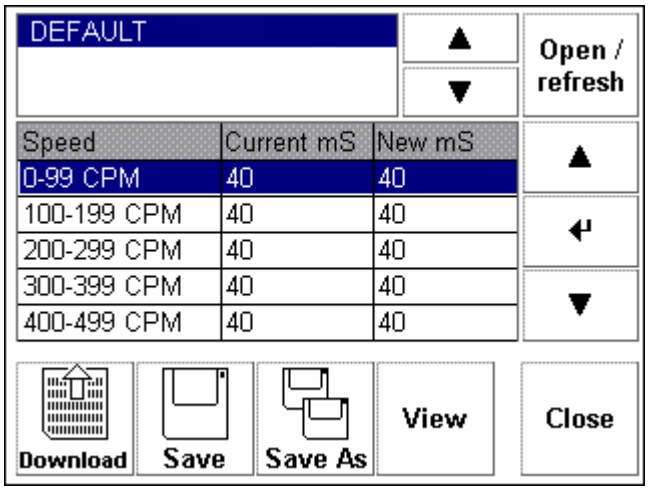
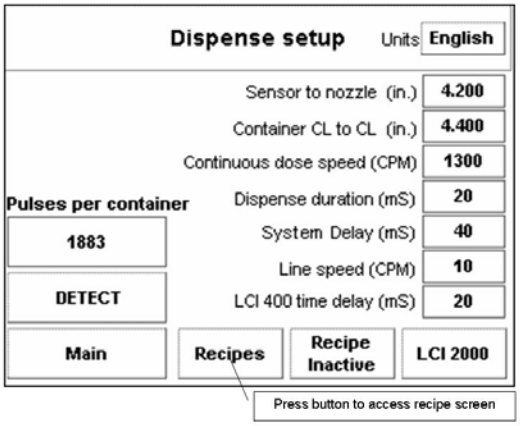


Figure 18: Recipe Screen

Creating a recipe

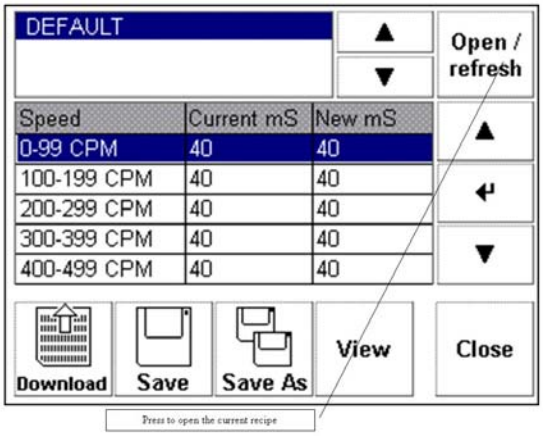
The following steps are required to create a recipe

From the Dispense Setup Screen press the RECIPE button

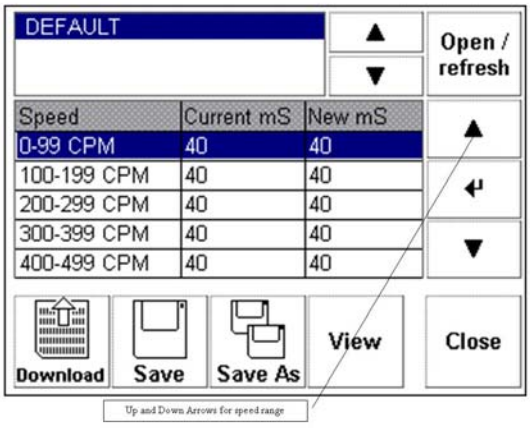


When the recipe screen appears, the default is highlighted.

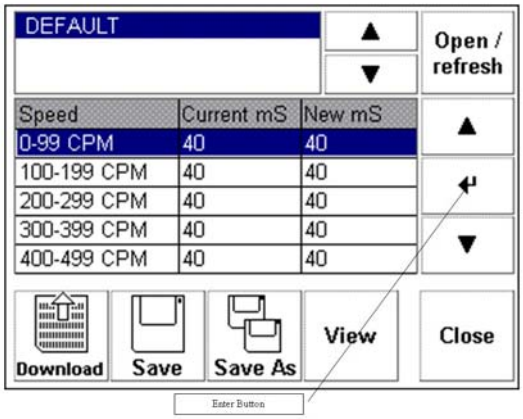
Press the OPEN/REFRESH button



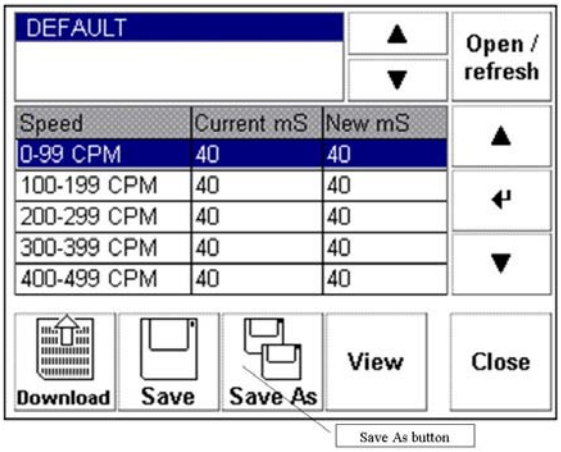
A recipe program screen will appear. Press the up and down arrows to highlight the speed range to be adjusted.



Press the ENTER button to make changes to the desired speed range



Enter the desired dose duration in the pop-up screen that appears.
Press enter to save the value
Repeat this procedure for all speed ranges.
Press the SAVE AS button. A pop up window will appear.



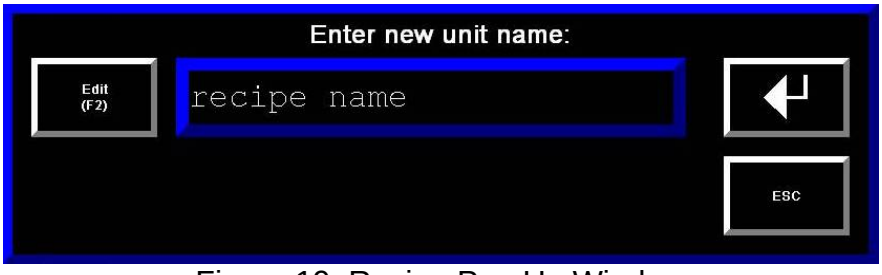
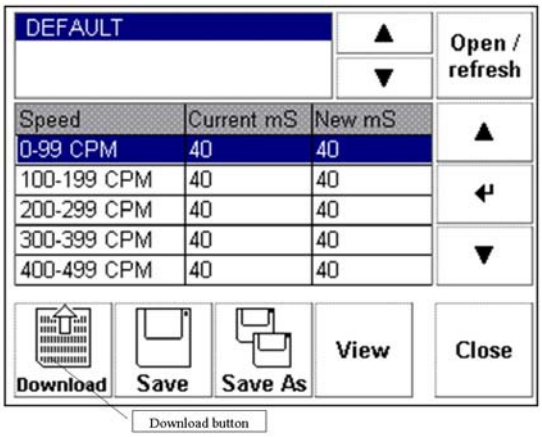


Figure 19: Recipe Pop Up Window

Press the EDIT button. A pop up keyboard window will appear.
Enter the name of the recipe using this window.
Press ENTER to save this recipe.
Press the DOWNLOAD button to load into the PLC program. A pop-up window will appear and advise the user that the recipe to be downloaded is different than the current recipe.



Press YES to continue with the download process.

Changing Recipes

- From the Dispense Setup Screen press the RECIPE button
- When the recipe screen appears, the default is highlighted.
- Press the UP and DOWN buttons to highlight the desired recipe
- Press ENTER button to select the desired recipe.
- Press the DOWNLOAD button to load into the PLC program. A pop-up window will appear and advise the user that the recipe to be downloaded is different than the current recipe.
- Press YES to continue with the download process.

IMPORTANT! - A recipe is not available to be used by the controller until it has been "downloaded" to the PLC. After the recipe has been saved it can then be downloaded with the download button.

Viewing the Current Recipe

- From the Dispense Setup Screen press the RECIPE button
- When the recipe screen appears, the default is highlighted.
- Press the VIEW button to open the recipe graph

The recipe graph can be closed by pressing the CLOSE button.

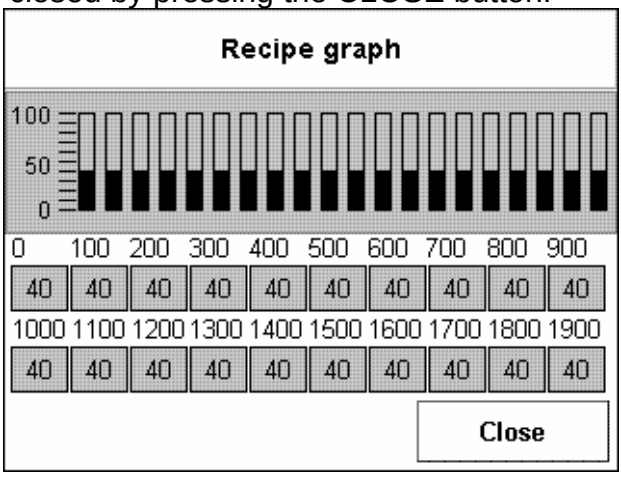


Figure 20: Recipe Graph

DAILY OPERATION PROCEDURES – SECTION VIII

System Start Up

1. If the system is Dewar fed, open the liquid valve on the Dewar.
2. Wait until the injector reservoir is filled with liquid nitrogen, approximately 10 minutes. When the injector is filling, it will vent heavily and there will be a steady stream of "fog/steam" from the vent. Once the injector is filled, there will be only a "wisp" of fog coming from the vent. If the injector overfills and liquid nitrogen starts dripping out the vent, close the liquid valve on the dewar and call Cryotech service. Do not operate the unit.
3. Ensure the DOSE DISABLE switch on the controller is illuminated (pushed in). This will prevent the injector from dosing until the operator is ready.
4. Turn the controller "ON" by rotating the Off/On switch mechanism to the On position. The front panel will show the DISPLAY screen if the controller is functioning correctly.
5. Adjust the dosing parameters. See Set Up Section of this manual for details.
6. Ensure the DOSE DISABLE switch on the controller is not illuminated (pulled out). This will allow the unit to begin dosing.

System Shut Down

1. Place the DOSE DISABLE switch on the controller in the illuminated (pushed in) position. This will stop the machine from dosing nitrogen.
2. If the system is Dewar fed, shut the liquid valve on the Dewar. If the hose is disconnected from the Dewar, the hose termination must be capped to prevent moisture intrusion.

   Rotate the Off/On switch to the Off position if the injector will be shut down for over 8 hours or if work will be done on the injector. If the injector is being shut down for a short time, less than 8 hours, it is not necessary to turn the unit off. It is desirable to have the heaters "on" during short production breaks to minimize freeze-up of the dosing head or vent area.

MAINTENANCE – SECTION IX

Maintenance - Routine

Nozzle Change Procedure

To change a nozzle:

1. If using a standard nozzle, the system is comes complete with a nozzle tool (4 mm hex nut driver) Insert the nozzle removal tool into the nozzle area until the tool connects with the nozzle. The optional SoftDose nozzles require different removal tools. A hex-head socket set will work in this application

   CAUTION: The dosing head heater is still in operation. Do not expose skin to prolonged contact with the dosing head heater.

2. Remove the nozzle by rotating the driver in a counter-clock wise direction.

   Note: If the nozzle does not loosen easily, drain the Injector and warm up nozzle with a low power heat gun. Do not expose the nozzle area to direct heat for extended periods of time as internal seals may be adversely affected.

3. Once the nozzle is removed, place the new nozzle or cleaned nozzle into the hex driver and insert in the Injector.

Nozzle Cleaning Procedure

1. Remove the nozzle from the Injector.
2. Clean the nozzle opening with a very thin wire and blow dry air through it.
3. Thoroughly dry the nozzle with dry nitrogen gas before re-installing the nozzle.

   NOTE: *Any moisture left on the nozzle will immediately freeze up when the nozzle is re-installed.*

Dewar Change Out Procedure

The Dewar should be changed out whenever the controller indicates that the supply pressure is low.

Note: *The Injector will continue to dose properly until the liquid level inside the LN_2 reservoir runs low. This feature gives the operator a reasonable window in which to change out the Dewar without disrupting the production operation.*

To change out the Dewar:

1. Close the liquid valve on the Dewar.
2. Disconnect the hose from the Dewar using a 5/8” wrench.
3. If a full Dewar is available, immediately connect the Cryotech*Flex* hose to the liquid outlet on the full Dewar.
4. If a full Dewar is not readily available, plug the 1/2” JIC end of the Cryotech*Flex* hose so that moisture is not introduced into the Injector.

Purging with Gaseous Nitrogen Procedure

General:
Purging is the introduction of “warm” gaseous nitrogen into the system. Any moisture in the system will form ice when subjected to liquid nitrogen temperatures. Warm nitrogen gas serves to defrost the system, melt the ice and force out moisture. As part of routine maintenance or if necessary due to a frozen injector, a purge should be performed. The injector must only be purged with gaseous nitrogen. Warming the nitrogen gas will accelerate the purging process.

The optimum nitrogen pressure is dependent upon the application, time and equipment available. In general, a low (approx. 5psi) pressure feed overnight is desirable. If time is of the essence a 40–50psi feed could be used. For specific recommendations contact Cryotech Service.

Cryotech recommends that after installation and prior to startup, the injector should be purged to eliminate any moisture that may be inside the unit. The injector may also require purging when there is liquid nitrogen flowing out the vent or when the nozzle becomes frozen shut. These two conditions require the injector be purged using the following procedure.

1. Remove or disable the LN_2 source.
2. Drain the injection unit via drain on the bottom of the body
3. Introduce warm GN_2 into the fill hose to the top of the injector. Allow GN_2 to flow into the injector until ambient gas is being vented out the vent. This may take several hours if the injector has just been drained.
4. To purge the dosing head/nozzle area, ensure the gas used to open the solenoid valve is off. Plug the vent opening so the GN_2 is diverted to the dosing head. Remove and reverse the tubes to the solenoid valve. In other words, switch the bottom to the top and the top to the bottom. Doing so will actuate the “Bimba” actuator keeping it open once the gas is turned back on. Turn on the gas to the solenoid valve. Open the GN_2 dewar valve so gas is running through the injector and to the dosing heater area.
5. Continue to run GN_2 to the dosing head until ambient gas is being vented out the dosing head/nozzle area. Again, this may take several hours if the injector has just been drained.
6. Once the procedure is complete replace the tubes to the Bimba, and remove the cap from the vent.
7. Install the drain plug into the injector body
8. Turn on the LN_2 supply

Maintenance - Preventative

Cryotech recommends the following preventive maintenance schedule.

1. **Filter Cleaning**
Cryotech recommends that the filter be cleaned only as necessary. Note that the filter must be thoroughly dried with GN_2 before it is re-installed.

TROUBLE SHOOTING – SECTION X

The Injector has many built-in trouble shooting features. The following describes some trouble shooting tips.

Condition: The safety relief valve is going off (venting).	
Possible Causes	**Actions**
1. The pressure of the LN_2 supply is greater than 50 psi.	1. Check the pressure of the LN_2 supply. If the supply pressure is greater than 50 psi, reduce the supply pressure. Note: A dewar can be vented to reduce the pressure.
2. The vent is obstructed.	2. Check the Injector vent. If the vent is obstructed, clear the obstruction. If the vent is obstructed with ice, contact Cryotech.

Condition: Liquid is being dispensed out of the vent.	
Possible Causes	**Actions**
1. The LN_2 supply pressure is too high.	1. Lower supply pressure to 22 psig or lower.
2. Ice has developed inside the unit, causing the internal float valve to malfunction.	2. Entire Injector unit must be drained of liquid, allowed to warm up over a minimum of 24 hours with a continuous purge of warm nitrogen gas at 5 -25 psig introduced at the vent opening. The supply connection must be open to allow the gas to flow freely through the entire system

Condition: Liquid is being dispensed out of the dosing head even though the main valve is shut close.	
Possible Causes	**Actions**
1. The LN_2 supply pressure is too high	1. Reduce the supply pressure
2. The valve seat is contaminated (ice or particles).	2. Drain LN_2 , remove valve, clean valve seat.
3. Air supply to the solenoid is reversed.	3. Reverse the LN_2 lines that supply and vent to the solenoid.

Condition: No liquid is being dispensed from the dosing head.	
Possible Causes	**Actions**
1. There is insufficient liquid inside the Injector unit.	1. Check the level of LN_2. If the level is empty or low, open the supply valve.
2. The system is in disable mode.	2a. Pull out dose disable switch 2b. Proceed to System Functions screen and press enable to enter enable mode.
4. The nozzle is frozen shut	4a. Remove, clean and reinstall the nozzle. **Note:** A purge may be necessary to remove a frozen nozzle.
5. The container sensor is not detecting a container.	5. Check sensor connections. Ensure the sensor is correctly positioned to detect points (gear tooth or the like) If necessary, replace sensor.
6. The speed sensor is not functioning	6. Check the speed sensor is operating correctly and is sending a signal to the controller.
7. All appears ok but the unit still does not dose.	8. Is an encoder being used? If not, is the sensor override button on? Set to on.

Condition: The dosing valve fault error is displayed.	
Possible Causes	**Actions**
1. The dosing valve assembly is not moving.	1. Check the pneumatic pressure. There must be at least 60 PSI to have the dosing valve function correctly.

Condition: The speed sensor fault error is displayed.	
Possible Causes	**Actions**
1. The speed sensor has been dislodged, moved or has shifted out of position.	1. Check speed sensor connections. Readjust.
2. The speed sensor has malfunctioned.	2. Replace speed sensor.

CONTACTING CRYOTECH FOR SERVICE – SECTION XI

If you are experiencing a malfunction with the unit and cannot isolate the problem, Cryotech technicians are available to provide phone support.

NOTE: BEFORE CALLING CRYOTECH, PLEASE ENSURE THE FOLLOWING QUESTIONS HAVE BEEN ANSWERED. CRYOTECH PERSONNELCAN BETTER ASSIST WITH TROUBLE SHOOTING YOUR SYSTEM IF THESE QUESTIONS HAVE BEEN ANSWERED.

Question	Your Response
1. What is the pressure reading of the LN_2 supply?	
2. What is the LN_2 level reading?	
4. What color light (if any) is illuminated on the 5 connectors on the distribution box?	1. Vent heater 2. Dosing head heater 3. Sensor 4. Valve 5. Valve confirm (shunt)
5. Wave an object in front of the container/timing sensor. a. Does the sensor cable connector flash yellow? b. Does the valve sensor flash yellow?	5a. Y/N? 5b. Y/N?
7. What (if any) error messages are displayed on the main screen of the Injector controller?	
8. What color is the indicator light (on top of the Injector controller)?	a. Red? b. Green? c. Yellow?
9. What was the last item changed on the Injector system?	
10. When was the liquid nitrogen supply last changed?	

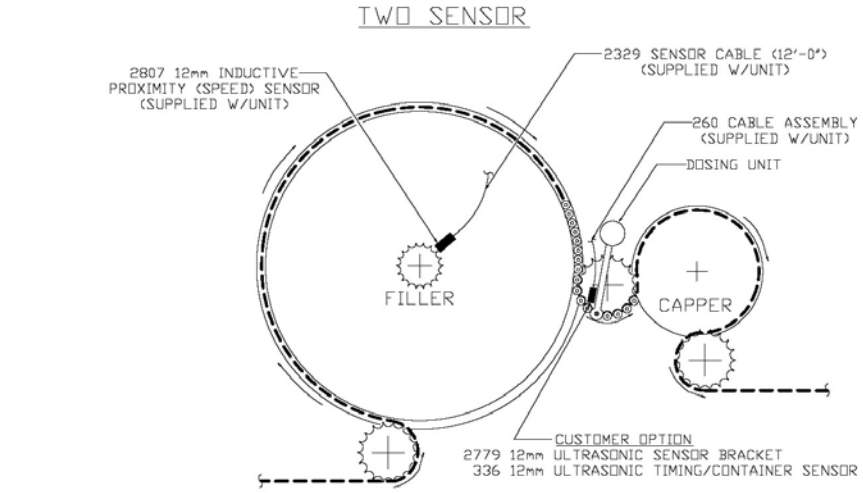
SERVICE PARTS – SECTION XIV

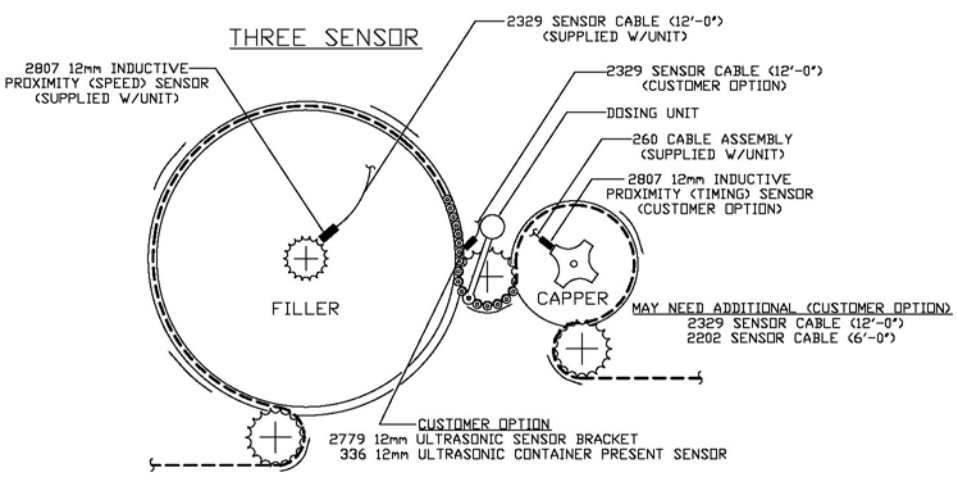
Name	Description	Cryotech Part Number	Comments
Transducer	0 – 5 PSI	2208	Liquid Level
Transducer	0 – 25 PSI	2209	Supply Pressure

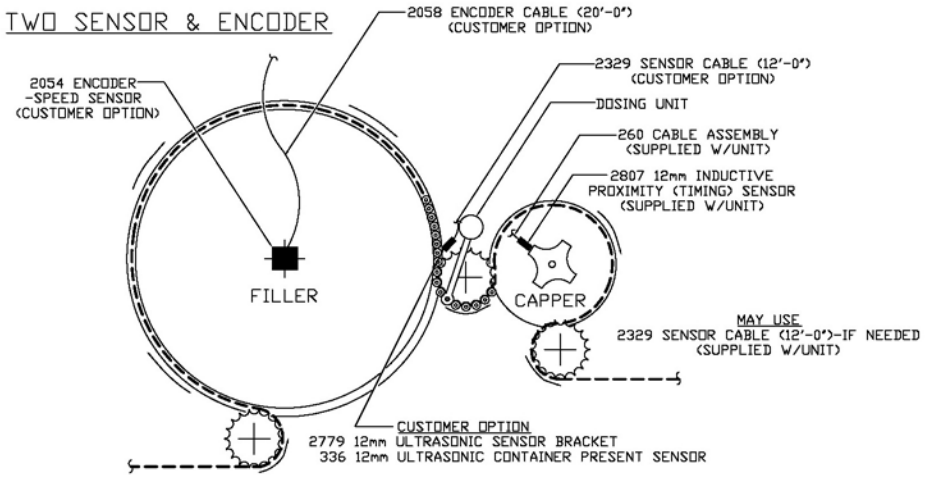
REPLACEMENT PARTS – SECTION XV

Part Description	Part Number
Dosing Head Parts	
0.060 Dosing Nozzle	102
0.050 Dosing Nozzle	104
0.040 Dosing Nozzle	103
Nozzle Tool 4mm Hex Nut Driver	362
Optical sensor (general purpose retro reflective sensor - Banner)	363
Optical Sensor Assembly(sensor, cable and connector)	364
Dosing Head Heater Assembly with Cable	106
Dosing Stem Assembly	141
Dosing Stem o-ring	275
Solenoid Valve – 4 way-MOD	140
Injector Reservoir Parts	
Inlet Filter	108
Drain Plug	109
Safety Relief Valve set to 50 psi	211
Vent Heater Assembly	105
Shaft collar	315
Injector Controller Parts	
Distribution Block with 36” Cable	207
Controller Extension Cable - 12’	209
Controller Extension Cable - 25’	210
Power Input Cable (Wall Plug Included for US orders)	143
Enable Switch	146
25A Power Rotary Switch	2820.10
Switch Shaft	2820.09
Off/On Rotary Switch Handle Assembly	2820.08
Power Cord Assembly (wall plug included for US orders)	410
Controller 24 vdc Power Supply	2820.05
Solenoid Valve Cable Assembly	1201
Confirm Sensor Cable (from distribution block)	2806
Confirm Sensor with Pico Fast Connector	2805
PNP Container Sensor Cable Assy. For UltraDoser	1200
Miscellaneous	
10’ CRYOTECH flex hose with Male bayonet	123
Stainless steel support stand	119
Gauge, 0-100 psi, 1-1/2”	135
Gauge, 0-100 psi, 2” , back mount	136
Gauge, 0-3 psi, 2-1/2”	134
Complete Gauge Assembly	133

Appendix A – Sensor Positioning




THREE SENSOR
2807 12mm INDUCTIVE PROXIMITY (SPEED) SENSOR (SUPPLIED W/UNIT)
2329 SENSOR CABLE (12'-0") (SUPPLIED W/UNIT)
2329 SENSOR CABLE (12'-0") (CUSTOMER OPTION)
DOSING UNIT
260 CABLE ASSEMBLY (SUPPLIED W/UNIT)
2807 12mm INDUCTIVE PROXIMITY (TIMING) SENSOR (CUSTOMER OPTION)
FILLER
CAPPER
MAY NEED ADDITIONAL (CUSTOMER OPTION)
2329 SENSOR CABLE (12'-0")
2202 SENSOR CABLE (6'-0")
CUSTOMER OPTION
2779 12mm ULTRASONIC SENSOR BRACKET
336 12mm ULTRASONIC CONTAINER PRESENT SENSOR


TWO SENSOR & ENCODER
2058 ENCODER CABLE (20'-0") (CUSTOMER OPTION)
2054 ENCODER -SPEED SENSOR (CUSTOMER OPTION)
2329 SENSOR CABLE (12'-0") (CUSTOMER OPTION)
DOSING UNIT
260 CABLE ASSEMBLY (SUPPLIED W/UNIT)
2807 12mm INDUCTIVE PROXIMITY (TIMING) SENSOR (SUPPLIED W/UNIT)
FILLER
CAPPER
MAY USE
2329 SENSOR CABLE (12'-0")-IF NEEDED (SUPPLIED W/UNIT)
CUSTOMER OPTION
2779 12mm ULTRASONIC SENSOR BRACKET
336 12mm ULTRASONIC CONTAINER PRESENT SENSOR

Appendix B – Wiring Diagram